ENERGOPTIONS

OVERVIEW PAPER

MUNICIPAL SECTOR

Recreational

OVERVIEW

MUNICIPAL SECTOR

Recreational

1. INTRODUCTION

In virtually every community, arenas, pools and recreation centres are provided for public use. These recreational facilities are an important part of Canadian life, but energy costs for their operation can be a heavy tax burden. Recently, however, demonstration projects using energy more efficiently, have shown that these costs can be reduced.

Energy retrofit programs in over 20 facilities from St. John's, Newfoundland, to Pine Point, N.W.T., are proving to be economical. Typical energy uses in these facilities include space heating, lighting, ice making, pool heating and hot water requirements. For these uses, over 30% annual savings can generally be achieved by implementing measures with a payback period of less than five years.

This paper provides an overview of a number of energy saving measures in recreational facilities, together with documentation of important lessons learned. Suggestions for appropriate next steps and details on resources available are also presented.

2. OPTIONS

With support from the Federal/Provincial Conservation and Renewable Energy Demonstration Agreements (CREDA) Program, a range of alternative options were demonstrated. Examples follow:

- **Lower Cost Measures**

  - Examine building ventilation system and make adjustments, if necessary. Typical measures include: balancing the air-ducting

system and adjusting outside air supply and exhaust for operating variations during the day.

- Tighten the building shell against cold air infiltration at the windows, doors, joints and dampers, using weatherstripping, sealing and caulking.

- Insure good general maintenance on a continuing basis so that problems causing energy leaks are systematically eliminated.

- If a facility is hot water or steam heated, insulate heating pipes and maintain system in top order.

- Use electrically controlled timers to set back the building temperature and turn off fans and lights when the building is not in use.

- Lock the thermostats to avoid unauthorized adjustments.

- Install restricted-flow shower heads, faucets and other energy saving devices in the domestic hot water systems.

- Reduce lighting to the lowest recommended levels, provided this level of illumination is acceptable to the public.

- Replace unnecessary windows with insulated wall sections.

Higher Cost Measures

- Relamp with high-efficiency lighting. (High-pressure sodium lighting has found general acceptance with the public in demonstration project communities.)

- Install demand controllers to reduce overall electrical cost which includes power demand and energy consumption.

- Use capacitors to improve the power factor on higher powered motors.

- Consider changing to smaller electrical unit heaters where this measure will limit electrical demand costs.

- Install an energy management control system to minimize costs of energy-using devices.

- Consider switching to the lowest cost fuel (energy source) in your specific area.

. **Arenas**

- Separately heat domestic hot water (typically at $40^{o}C$ ($104^{o}F$)) and flood water (typically at $75^{o}C$ to $90^{o}C$ ($167^{o}F$ to $194^{o}F$)).

- Reclaim heat from ice-making equipment for water and/or space heating purposes.

- Cycle the brine pump by timer-control to reduce energy costs.

- Consider using two smaller compressors instead of one larger unit. Peak power demand and energy consumption can be reduced as only one would likely be required during cold weather.

- Consider a low-emittance ceiling to reduce dark-ceiling radiation softening of the ice surface and also to minimize dripping and condensation corrosion in the ceiling with attendant high repainting cost.

. **Pools**

- Cycle the pool recirculation pump. Switch it off when pool is not in use.

- Use a "thermal pool blanket" to reduce evaporative heat loss from the pool's surface when the pool is not in use.

- Reduce ventilation air velocity over wet surfaces (pool, floor, etc.) to minimize evaporative heat losses.

- Recover heat from exhaust air using a suitable exhaust/supply heat exchanger.

- Consider pool dehumidification with energy recovery using a heat pump or equivalent.

. Items Generally Not Cost-effective

- Increasing the building's insulation level only for the sake of energy conservation is generally not cost-effective. However, it is cost-effective to increase the insulation level during a building renovation program.

- Use of destratification fans in arenas and over pools is questionable.

- Lighting dimmers in facilities with relatively low annual usage, such as small arenas, are hard to justify.

3. CREDA DEMONSTRATIONS

The CREDA case studies outlined below provide a sample of the many options for reducing energy consumption and related costs in recreational facilities. Although these projects by no means represent the full range of possible options, they do provide tangible evidence of the very significant cost savings that can be realized in arenas, curling rinks and pools. As well, they provide practical installation and operation experience.

The demonstration project Case Studies detailed in this ENEROPTIONS package are:

REC 1 Arenas and Curling Rinks

Energy retrofits in 12 community arenas and curling rinks across Canada saved as much as 55% annually. The range of costs and savings associated with individual measures are detailed.

REC 2 Indoor Swimming Pools

Three separate communities substantially reduced energy costs for their local pools. Specific information on the use of a heat pump to reduce humidity, heat recovery from exhaust air, electrical demand control and night setback is included.

REC 3 Large Recreational Centres

Savings of 20% to 40% were achieved in large multi-purpose facilities. These measures included: low-cost saving techniques, infiltration reduction, heat reclaim systems and control via the use of a microprocessor.

REC 4 Large Indoor Pools

Energy costs in two Olympic-sized pool complexes are noticeably reduced by controlling humidity levels, reclaiming heat from exhaust air and employing an energy management/control computer. Annual savings range from 18% to 30%.

ONT 47 Water-Source Heat Pumps - Valley East, Ontario

A new recreational complex is heated using water-to-water heat pumps for space and pool heating. The heat pumps extract heat from groundwater drawn from a supply well. This lowers the temperature of the water which is then returned to the aquifer through a discharge well.

Many other energy projects have been undertaken with municipal recreational applications. Contact your nearest federal or provincial energy office to learn more about nearby projects or those in applications similar to yours.

4. LESSONS LEARNED

- **Low-cost Measures**

The understanding and commitment of building operational staff is an important key to success. These people can usually offer excellent suggestions on low-cost measures. Later in the program, when higher cost measures are implemented, maximum savings will only be obtained with the dedication and cooperation of operational staff who keep the equipment in top running order.

Many low-cost measures can be implemented by operational staff and local contractors without assistance from energy specialists. Experience shows that these measures are cost-effective and funding can generally come from existing operating budgets.

- **Higher Cost Measures**

Since each facility is unique, the services of a qualified in-house energy auditor or experienced consultant should be obtained to identify an appropriate program of higher cost measures.

A thorough energy audit is the first step recommended. Details on costs and savings experienced in other locations can be useful in determining the scope for a specific energy audit.

Encourage the building operational and maintenance staff to work closely with the energy auditor during the study phase. Their familiarity with the facility and their suggestions are usually very valuable. Also, their commitment to the measures that are eventually installed is often critical.

It is important that the energy auditor considers the real capabilities of operational staff when recommending particular approaches. There is little to be gained by installing complicated systems or devices that cannot be operated or maintained properly.

- **Arenas**

Significant energy can be saved by separating the ice flood water from the domestic hot water. The domestic hot water need only be heated to a minimum acceptable level (40°C (104°F)). By using separate, hotter water (75°C to 90°C (167°F to 194°F)) for flooding, a suitable ice surface can be maintained with a reduced amount of water. This helps to keep the ice thin and minimizes energy requirements for the refrigeration plant.

When recovering heat from ice-making equipment, it is generally more cost-effective to use the recovered heat to preheat water (ice flood and domestic hot water) rather than for space heating.

When an ice plant is equipped with a heat recovery unit, savings can be maximized by flooding the rink just prior to periods of high recovered heat demands, such as required for shower water or space heating.

The use of destratification fans in arenas can sometimes place an extra load on the ice plant by forcing warm air downward which softens the ice surface.

- **Pools**

In reducing humidity levels and conserving energy in indoor pools, glycol-loop heat exchange systems are sometimes more cost-effective than heat pumps (higher humidity levels require greater numbers of air changes).

5. NEXT STEPS

To assist you in considering cost-effective energy alternatives for your recreation facilities, "next steps" are suggested below:

- Establish your present energy costs as accurately as possible.

- Establish administrative responsibility for energy consumption in your recreational facilities. It is recommended that this responsibility be placed with senior personnel. Depending on the scale of the recreational facilities, the establishment of an energy management committee consisting of technical and financial personnel may be warranted.

- Undertake an energy audit to identify the appropriate package of measures for your facility.

- If you lack the necessary in-house engineering resources to identify and implement the appropriate package of measures, then retain the services of a qualified engineering consultant.

6. RESOURCES AVAILABLE

Free technical reports are available on most of the CREDA projects listed above. Addresses of appropriate contacts for follow-up, including equipment suppliers and system designers, are listed at the end of each of the attached ENEROPTIONS Case Studies under the "Further Information" section.

Manuals on Energy Conservation for "Indoor Ice Rinks" and "Indoor Pools" are available from:

ENEROPTIONS
Energy Information Centre
Manitoba Energy and Mines
117-234 Donald Street
Winnipeg, Manitoba
R3C 3M8
(204)945-4154

The departments or ministries of energy in each province or territory have information on energy conservation and renewable energy and may have assistance programs. Check your telephone directory for appropriate contacts.

The Conservation and Renewable Energy Offices (CREOs) of Energy, Mines and Resources Canada in each province and territory have information on demonstrations, and other assistance programs. Check the back of the attached file folder for the office in your area.

Information on qualified engineering firms by area of specialization and the "Recommended Procedure for the Selection of an Engineer to Provide Professional Services" can be obtained from:

(a) The Association of Consulting Engineers of Canada
(Re: ENEROPTIONS)
Suite 616
130 Albert Street
Ottawa, Ontario
K1P 5G4
(613) 236-0569

(b) The consulting engineering organization in your province.

Information on innovative financing arrangements may be obtained through the government sources listed above or by contacting:

Martin Adelaar
(Re: ENEROPTIONS)
Energy Management Advisor
Energy Conservation and Oil Substitution Branch
Energy, Mines and Resources Canada
580 Booth Street
Ottawa, Ontario
K1A 0E4
(613) 995-1118